National Aeronautics and
Space Administration
Goddard Space Flight Center
Greenbelt, MD 20771

07/20/01

TO: Polar PIs

FROM: Polar Project Scientist and Assistant Project Scientist

SUBJECT: Proposals for Polar Extended Mission

In anticipation of approval by NASA HQ for extended mission operations for the Polar satellite within the GGS program, we are requesting the submission of proposals from your institution and any Co-I institutions that Goddard has been funding separately. These proposals should cover three years, FYs 2002-2004, since this is the maximum period of performance for grants

While we are optimistic that the Polar funding will be comparable to the funding in FY2001, we will not have a firm number until after HQ has considered the recommendations from the Senior Review, which is not scheduled until September. In the interest of minimizing the proposal effort, the attachment indicates whether we need a proposal immediately due to an early anniversary date on your grant or contract, or whether your proposal(s) can wait until after we obtain a firm budget number for FY02. For immediate proposals it is very possible that a revised budget will be required after we obtain the firm budget. Irrespective of the time for your proposal, as PI you will be expected to allocate the distribution of funding within your science team and indicate that to us now.

If funding for your Investigation will be through a grant, please submit a grant proposal through your normal channels directly to us. Three copies will be sufficient. If funding will be through a contract, you will receive a request for a proposal. To assist us in preparing a statement of work for your contract, please send us a draft statement.

The Polar proposals should contain the following information (with guidelines for length):
1. Sign-off sheet from your institution
2. A short description of the status of the instrument and its operations (1/2 page)
3. A description of the status of data processing, the products available, and the methods of access to these products (1-2 pages)
4. A summary of the key scientific accomplishments to date, not measurement accomplishments (2 pages)
5. A summary table of the number of presentations by FY.
6. A summary table of the number of publications by FY, separated into two sets:
   a) Publications for which a member of your team is first author
   b) Publications for which a member of your team contributed.
   For FY01 please separate into submitted, accepted and published.
   Make sure your web site of publications is up-to-date.
7. A clear statement of work for each of the three years (2 pages). For those of you who will continue to be funded with a contract, include deliverables and schedule, but do not indicate the delivery of commands to the SPOF. Only state that you provide guidance to the SPOF.
8. A brief, clear description of the purpose of each labor category, and name(s) of people involved, if possible.
9. Budget. Note that a subcontract to Co-Is at institutions other than the PI institution in amounts exceeding $100,000 require the attachment of a proposal from the Co-I institution.
For both grants and contracts, please separate the funding into four categories: program management, instrument operations, data acquisition and processing, and science. Include any E/PO work in science.

10. Required certifications.

Specific information regarding your investigation is contained in an attachment.

Bob Hoffman and Barbara Giles

ATTACHMENT

TO: TIDE PI

We suggest that the proposals associated with the TIDE investigation total $365K each FY.
We assumed that Vanderbilt will not receive any funding in FY02, and the Michigan funding can be for 8 months in FY02 to move up their anniversary date.

Please provide the distribution of funding between the PI institution and Co-I institutions. Please confirm whether the following funding scheme used for FY 01 will continue:

Institution	Funding Method	Anniversary Date	Proposal Submission
GSFC	---	FY	Immediate

TIDE/GSFC will continue to handle any other grants.

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, MD 20771

PROPOSAL SUBMITTED IN RESPONSE TO: POLAR PROJECT REQUEST

Program Element: Polar Extended Mission

Type of Mission: Polar Orbiting Plasmas and Fields

Title: Thermal Ion Dynamics Experiment-Plasma Source Instrument

Principal Investigator:

T. E. Moore
Head, Interplanetary Physics Branch
Laboratory for Extraterrestrial Physics
Code 692, Bldg. 2-138
Greenbelt, MD 20771
Voice: 301-286-5236, Fax 707-988-7835
E-mail: Thomas.E.Moore@gsfc.nasa.gov

Thomas E Moore 2001/10/01

Signature: Date:

Lead Co-investigators:

Dr. M. O. Chandler, NASA Marshall Space Flight Center
Dr. C. R. Chappell, Vanderbilt University
Prof. J. L. Horwitz, University of Alabama in Huntsville
Prof. A. F. Nagy, University of Michigan
Dr. C. J. Pollock, Southwest Research Institute

Co-investigators:

Prof. R. H. Comfort, University of Alabama in Huntsville
Dr. P. D. Craven, NASA Marshall Space Flight Center
Dr. B. L. Giles, NASA Goddard Space Flight Center

Institutional Endorsement:

Dr. Jonathan F. Ormes
Director of Space Sciences
NASA Goddard Space Flight Center, Code 600
Greenbelt, MD 20771

Signature: Date:

Budget Summary (FY98k$):

3 Years, FY99-01

1st Year	2nd Year	3rd Year
450k$	450k$	450k$

PROPOSAL SUMMARY

TITLE OF INVESTIGATION: Thermal Ion Dynamics Experiment-Plasma Source Instrument
PI/ INSTITUTION: T. E. Moore/GSFC

Data Acquisition Status: The TIDE-PSI team acquires instrument data routinely and continuously, including the periods when MCP gain is set back for the radiation belt passages.

Routine PSI operations have been discontinued because ignition can no longer be achieved. We expect to request to attempt ignition roughly once or twice per year.

Data Processing Status: The TIDE RDAF and database are the standard-bearers for the Polar community. All TIDE-PSI data, from calibration and first day of operations on orbit to the most recent available from the CDHF, is on-line and open to the community via the internet and world wide web at two sites, one at NSSTC and a mirror site at GSFC. All graphic formats and reduced parameters for calibrated data, at user-selected resolution, are freely available. Anything that TIDE team members can do at their desks with TIDE-PSI data can also be done by any other user with access to an Internet connection.

All TIDE-PSI data, up to the most current available from the CDHF, undergo routine processing to provide calibrated key parameters, summary graphics, and high resolution reduced parameters for the TIDE database. TIDE data processing and archiving is fully automated and performed by the RDAF workstations, with the exception of health & safety, error checking, and routine software maintenance. TIDE calibration is complete. All TIDE data is maintained on-line through the TIDE RDAF, and the TIDE key parameters are archived with the ISTP SPOF and the NSSDC.

Scientific Accomplishments: The following noteworthy scientific accomplishments grew out of the solar maximum mission phase of TIDE-PSI data acquisition:

- Discovery of “Ionospheric Mass Ejections” and Response to Pdyn
- Lack of IMF Influence on Outflows
- Importance of Centrifugal Acceleration Established
- Geopause Established as Observational/Theoretical Boundary
- Local Influences on Ionospheric Outflows Clarified
- PSI Sheath Understood
- Dayside Outflow Origination at Equatorward Part of Cusp
- Substantial Plasmaspheric Plasma Densities at Dayside Magnetopause

We propose continued acquisition, processing, correlative analysis, and interpretation of low-energy plasma data using the TIDE-PSI complement of instruments on the Polar spacecraft. During the solar declining period, Polar’s orbit will permit explorations of spatial regions that have been previously inaccessible to most spacecraft, including Polar. This will make it possible to expand on the overarching Polar mission goals, recovering some of the goals of the deleted EQUATOR mission. Of these, the most relevant to TIDE-PSI is the measurement of low-energy plasma transport within the magnetosphere in the equatorial region. Now we now seek to 1) document and understand the dependence of equatorial transport upon the solar wind interaction, and 2) understand the influence of solar-dependent plasma transport upon the development of magnetospheric storms.

Operations And Data Acquisition Status

TIDE is operating nominally and continuously. Its time-of-flight system was rendered inoperative gradually over the first six months of operation during 1996, by loss of sensitivity in the carbon foil and Start detector system. The data are seriously degraded by this effect from mid-August '96 until early Dec.1996. In fall 1996, a flight software patch was developed by SwRI and uploaded to generate a data product from the Stop detector count rates. This data product is necessarily integral over all ion species. The seven Stop detectors are combined such that the total ions data product is a measure of the integral flux across the full polar angle range of TIDE (all seven apertures). Nominal response is obtained in energy and in spin or azimuth angle. Thus, TIDE measurements after Dec.1996 are non-mass analyzed and 2D instead of 3D in velocity, they are still omni-directional in polar angle. In practice, H^+ and O^+ ions can be resolved in circumstances of high Mach number, similar to the situation in the solar wind.

TIDE detector biases are reduced under stored command control during each passage through the region L<8. This reduces the detector sensitivities, preventing overcounting that would otherwise result from TIDE susceptibility to penetrating energetic electrons. This susceptibility results from the use of large detector areas for sensitivity and minimal radiation shielding for mass savings. The detector bias reductions had the side effect of initially preventing TIDE from making routine plasmaspheric observations. During 1997 and early 1998, TIDE detectors were gradually adjusted until a diffuse background of penetrating radiation was observed at a low level. The relatively large fluxes of plasmaspheric ions exceed by far the penetrating electron response, permitting routine plasmaspheric observations since fall of '97, with improving quality as the biases were optimized.

PSI had been operated on a schedule set by the Polar science working team, up until the Fall of 2000. The schedule called for nearly continuous operations for two-week periods that started every ten weeks (20% duty cycle). A proviso to this schedule calls for PSI to be turned off during perigee passes across the auroral zones whenever practical, and insofar as possible, for PSI operations to be evenly distributed in local time. The cusp proper did not receive coverage in proportion to its importance as an ionospheric outflow site, but is instead was treated the same as all other local time sectors.

PSI is currently inoperative, because the discharge would not ignite during recent attempts. The discharge has been balky at startup since its first operation. Extended heating of the cathode and more than one ignition attempt were often required. Because of this, it was never possible to implement an automated startup routine, and the flight operations team started PSI under real time control. A capability to shutdown under stored command control was developed, however. It is believed that the discharge ignition problems are related either to contamination of the cathode by propellant, or may possibly result from gradual deterioration of the 1kV "kick" supply that is used briefly during ignition to initiate the discharge. Unfortunately, no effective diagnostics of the kick supply are obtained in the data stream.

Data acquisition accomplishments include: routine acquisition of TIDE data @ 100% duty cycle; routine supply of commands to the FOT for TIDE radiation belt passes; optimization of plasmasphere commands and continued improvements in data quality; successful and timely operations in support of spin maneuvers; periodic attempts at PSI ignition, with SWT approval.

Data Processing Status

All TIDE-PSI data, from calibration and first day of operations on orbit to the most recent available from the CDHF, is on-line and open to the community via the internet and world wide web. All graphic formats and reduced parameters for calibrated data, at user-selected resolution, are freely available. Anything the TIDE team members can do at their desks with TIDE-PSI data can also be done by any other user with access to an Internet connection. The TIDE RDAF consists of four Sun/Unix workstations at NSSTC, and one additional Sun/Unix workstation at GSFC, which serves as a mirror site as a hedge against downtime at either site.

All TIDE-PSI data, up to the most current available from the CDHF, undergo routine processing to provide calibrated key parameters, summary graphics, and high resolution reduced parameters for the TIDE database. TIDE data processing and archiving is fully automated and performed by the RDAF workstations, with the exception s of health & safety, error checking, and routine software maintenance. TIDE calibration is complete. All TIDE data is maintained on-line through the TIDE RDAF, and the TIDE key parameters are archived with the ISTP SPOF and the NSSDC.

Table 1. TIDE-PSI Data, Resource, and Documentation Summary

Name	Description
Level Zero Data Files	Unprocessed telemetry in 24 hour files
Key Parameter Files	Data processed to moments at 1 min. time resolution
Engineering/Housekeeping Summaries	Stack plots of selected housekeeping data
3D Chromogram Summaries	Single page summary of all 3D data (mass, energy, polar and azimuth angle distributions)
24 Hour Summaries	Chromograms, spectrograms, or HTR spectrograms
Half Orbit Summaries	Chromograms, spectrograms, or HTR spectrograms
Perigee Pass Summaries	Chromograms, spectrograms, or HTR spectrograms
2D Spectrograms	Single panel with energy and spin distributions
High Time Resolution Spectrograms	Two panel spectrogram (spin-t and energy-t) with maximum time resolution
Key Parameter Plots	Stack plot of selected key parameter s vs. time
High Time Resolution Moment Plots	Stack plot of selected moments at maximum time resolution
3D Velocity Distribution Plots	Two panel 3D velocity distributions in s/c coordinates
2D Velocity Distribution Plots	Single panel 2D velocity distribution in s/c coordinates
Velocity Distribution Time Series	Series of single panel 2D velocity distributions.
Flight Software Specifications	Complete description of all software-controlled functions
Flight Software User Manual	Abbreviated description of user options
LZ Processing Software	Complete collection of all common-use processing options
Key Parameter Generation Software	Generates moments without merged s/c potential from EFI.
Database Query Software (Web-based)	Supports identification of all data meeting multiple criteria
PAPCO module for TIDE data	Supports multi-instrument/spacecraft plotting on common time base.

Data processing accomplishments:

- Generation of background and noise characterization procedure.
- Generation of improved mass and sensitivity calibration through in-flight techniques.
- Cross calibration of TIDE H^+ temperatures and parallel velocities with those of TIMAS.
- Cross calibration of O^+ perpendicular velocities with convection velocities obtained by using electric fields from EFI and magnetic fields from MFE.
- Development of a calibrated processing tool.
- Certification of the KPGS code.
- Development of a working PAPCO graphics module.
- Developed measurements of convection and electric field in GSM coordinates at high altitude in the polar cap.
- Long term monitoring of MCP detector sensitivities using solar EUV leakage signal.

Key Scientific Accomplishments

Discovery of "Ionospheric Mass Ejections" and Response to Pdyn

The TIDE-PSI team realized with the 24 September 1998 CME arrival that dayside ionospheric outflows respond essentially immediately to sudden increases in the solar wind dynamic pressure [Moore et al., 1999; Cladis et al., 2000; Strangeway et al., 2000]. Substantial pressure increases and associated fluctuations often accompany coronal mass ejections, producing multiple order of magnitude increases in the mass flux of ionospheric outflow. Since such increases often precede the arrival of geoeffective IMF variations, it may be concluded that ionospheric outflow enhancements are an early phase phenomenon characteristic of magnetospheric storms.

Lack of IMF Influence on Outflows

The TIDE-PSI team has continued much earlier studies of the Dynamics Explorer data sets [Pollock et al., 1988; Giles et al., 1993; Elliott et al., 2001; Giles et al., 2001], and has found that the lack of apparent response to IMF is a characteristic of low energy ionospheric outflows, even of heavy ions. This result is exceedingly perplexing in view of the otherwise apparent association of ionospheric outflows with geomagnetic activity, and in turn the association of geomagnetic activity with IMF direction, especially SBZ. This puzzle fully merits additional study so that it can be fully understood, but is nevertheless a robust result that has spanned two major NASA space physics mission data sets.

Importance of Centrifugal Acceleration Established

A number of TIDE-PSI studies [Delcourt et al., 1990; Horwitz et al., 1994; Su et al., 1998; Winglee, 1998; Stevenson et al., 2000] have now firmly established the reality of a substantial centrifugal "flinging" effect of strong high latitude convection on the low energy ionospheric thermal plasmas. Both the theoretical foundations of this effect and observational confirmation have been established by the TIDE-PSI team and its associates. Initially rejected by the polar wind community, this phenomenon is now widely accepted as a significant driver of heavy ion outflows and as a determinant of their extent in the plasma sheet.

Geopause Established as Observational/Theoretical Boundary

The geopause, initially defined as a hypothetical dividing line between plasmas dominated by solar and terrestrial plasmas, has been clearly observed by the Polar spacecraft [Chandler et al. 1999; Moore et al., 1999], and is beginning to be observed by other spacecraft as well, notably Cluster II, which has observed periods of ionospheric plasma dominance just inside the dayside magnetopause. Now that the theoretical basis for this boundary has been developed [Winglee, 1998], it is beginning to serve as a conceptual construct that is as useful as the heliopause as a separator between solar and interstellar material at the boundary of the heliosphere.

Local Influences on Ionospheric Outflows Clarified

The focus created by TIDE-PSI studies of solar wind influences on global ionospheric outflows [Moore et al., 1999; Elliott et al., 2001] has generated a great deal of interest in the mechanisms by which outflows are generated on a local basis [e.g. Strangeway et al., 2000]. More recently, the GEM community has defined this as a critical problem in Magnetosphere-Ionosphere coupling, worthy of a GEM campaign. Attention initially focused on the gross Poynting flux of energy into the ionosphere, but now it is being found that particle precipitation, especially at low energies, is very important as well. Several papers are in development in the community, many of them involving TIDE-PSI participation.

PSI Sheath Understood

A paper reporting a 3D simulation study of the PSI sheath was published recently [Singh et al., 2001]. This culminates a thorough study of the PSI behavior on Polar, and an effort to simulate it with similar thoroughness. The essential observations of the PSI sheath obtained by Polar are reasonably well reproduced, and can be understood as the result of 3D kinetic physics in the spacecraft sheath region.

Dayside Outflow Origination at Equatorward Side of the Cusp

In a recently accepted study [Valek et al., 2001], it was found that interesting structure can be observed when ionospheric plasma outflow observations are organized according to the time-variable location of the cusp field lines. In particular it was found that the equatorward edge of ionospheric heating and outflow is located substantially (1-2°) equatorward of the edge of cusp ion precipitation. This likely represents a region of cusp electron precipitation that is separated from the cusp ions by velocity filtering.

Substantial Plasmaspheric Plasma Densities at the Dayside Magnetopause

A developing study of TIDE-PSI data promises significant results in the future [Chandler et al., 2001, unpublished manuscript]. This study, which parallels to some extent similar work being reported from the Cluster II mission, shows that the geopause may often lie essentially coincident with the dayside magnetopause, in regions where plasmaspheric material is being drained to that region.

Presentations And Publications

The URL of the TIDE-PSI presentation and publication list is:

http://satyr.msfc.nasa.gov/TIDE/papers.html

Its contents are summarized numerically in the table below, and the list as of proposal submission is appended to the proposal below.

Table 2. TIDE-PSI Presentation/Publication Summary

Type	Team Author	Other Author
Presentations		
1995-96	15	1
1997	20	4
1998	12	
1999	11	5
2000	15	2
2001	10	-
Refereed Papers		
1995-96	1	
1997	1	
1998	6	3
1999	6	
2000	5	3
2001	7	2

Proposed Work Statement

The following table summarizes the work plan by institution and fiscal year for this proposal. Subsections below further elaborate upon the science tasks that have been identified in the table, broken into tasks for which the lead and other key participants are indicated under each heading. These leads have taken the initiative to formulate a task description, but there is considerable collaboration across institutional boundaries within the TIDE team on these tasks, so they cannot be separated from each other.

Institution/Year	2002	2003	2004
GSFC	Science Leadership	Science Leadership	Science Leadership
	Data Flow Mgt.	Data Flow Mgt.	Data Flow Mgt.
	Outflow Influences	Outflow Influences	Outflow Influences
NSSTC	Operations Mgt.	Operations Mgt.	Operations Mgt.
	Low Shear Magnetopause	Low Shear Magnetopause	Low Shear Magnetopause
	Polar/IMAGE Outflow	Polar/IMAGE Outflow	Polar/IMAGE Outflow
	Cusp Plasma Heating	Cusp Plasma Heating	Cusp Plasma Heating
	Plasmaspheric Drainage	Plasmaspheric Drainage	Plasmaspheric Drainage
UA Huntsville	Polar-DMSP Studies	Polar-DMSP Studies	Polar-DMSP Studies
	Topside Modelling	Topside Modelling	Topside Modelling
SwRI	Operations Support	Operations Support	Operations Support
	High Altitude Polar Wind	High Altitude Polar Wind	High Altitude Polar Wind
	Outflow Influences	Outflow Influences	Outflow Influences
U Mich.	Ring Current Feeding	Ring Current Feeding	Ring Current Feeding
	Plasmaspheric Drainage	Plasmaspheric Drainage	Plasmaspheric Drainage
Vanderbilt U	Plasma angular distrib.	Plasma angular distrib.	Plasma angular distrib.
	Transport modeling	Transport modeling	Transport modeling
	Polar-Geotail studies	Polar-Geotail studies	

Operations

Lead: P. D. Craven/NSSTC, also V. N. Coffey, M. A. Sloan,

The TIDE-PSI team will supply the flight operations team with detailed advice concerning the operation of the TIDE and PSI instruments, in support of satellite maneuvers. This will consist of mode or parameter updates and changes, onboard software patches or updates, recommended recovery from anomalies, and routine monitoring of health and safety. In addition, the TIDE-PSI team will be responsible for creating and supplying command files for daily TIDE operations and any operations of PSI. NSSTC, under the guidance of the PI and the TIDE team, will be responsible for planning and implementing data acquisition strategies in support of these tasks.

Operations Support

Lead: C. J. Pollock/SwRI

SwRI maintains an engineering model of the TIDE-PSI DPU that permits thorough testing of software revisions prior to upload, as well as hardware tests of proposed operations scenarios. Personnel at SwRI will continue to provide scientific and technical consultation on TIDE instrument maintenance on orbit. Areas in which SWRI scientific and technical staff have provided such services include high-voltage commanding and management, interpretation of housekeeping measurements including temperatures, development and engineering model verification of data uploads and software patches, and deconvolution & interpretation of data . C.J. Pollock of SwRI was centrally involved in the laboratory test and calibration of the TIDE instrument at NSSTC and is uniquely qualified to contribute to the TIDE effort in these areas.

Data Flow

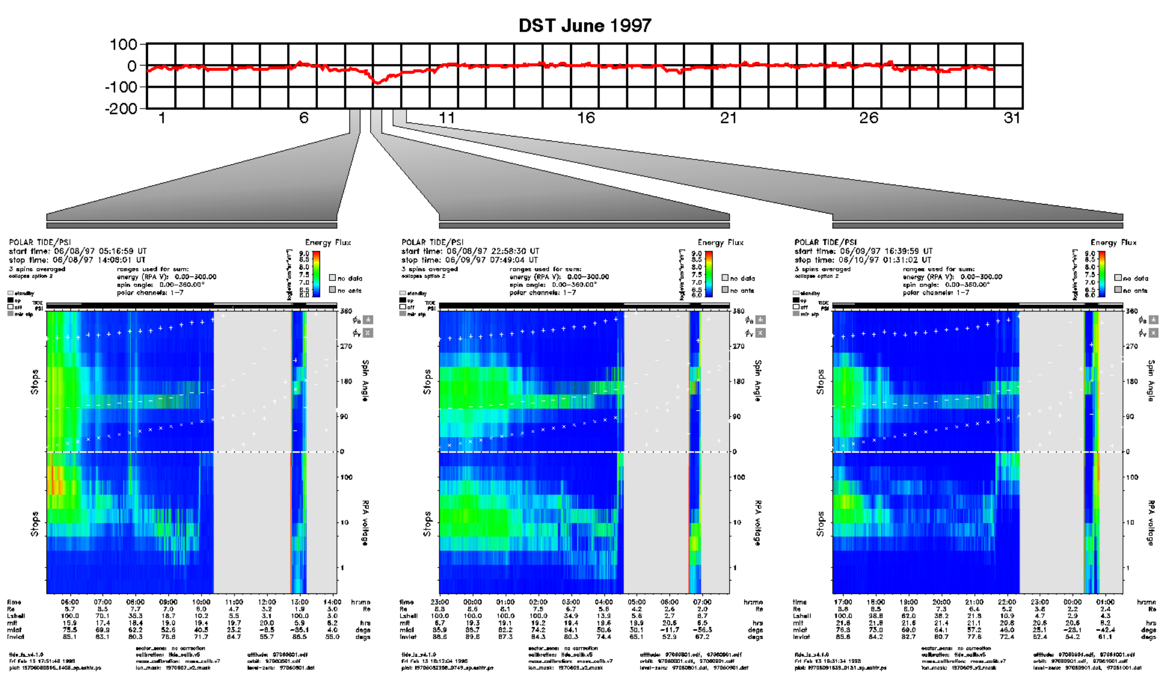
Lead: B. L. Giles/GSFC, also M. A. Sloan;/NSSTC

During the extended mission, we will maintain the RDAF, updating the web technologies to newer formats, with better error checking, and continuously improving methods of data service. As resources permit, will add features to the software, such as a temporal "zoom" feature when browsing summary plots. We will perform routine archiving of data and database management, data processing and reduction, generation of summary data, general system administration, software development and maintenance and hardware maintenance. We will provide TIDE high-resolution data files to the NSSDC consisting of graphics and reduced parameter CDF files that may easily be manipulated with the PAPCO software package. The TIDE data processing software will continue to evolve. Planned targets of improvement include the reduced parameters algorithms, the TIDE PAPCO graphics module, and formulation of a method to deconvolve the polar angle response of the instrument resulting from loss of carbon foil function. The TIDE-PSI team will maintain and improve the TIDE/PSI data analysis software, including updates and modifications, and the development of new analysis tools. Central configuration control of the software will be performed by professional programming staff. This includes continued improvements to the existing Level-0 processing and analysis code, ongoing development of the TIDE PAPCO module, and updates to the graphics and visualization products, and their Web implementations.

High Altitude Polar Wind

Lead: C. J. Pollock/SwRI

An interesting aspect of the high altitude terrestrial polar wind outflow involves its composition and the dependence of its composition upon solar wind drivers [Moore et al., 1999] and geomagnetic activity. Judging from the energy distributions, the polar wind observed by TIDE is typically composed of a single species, presumably H^+ [Su et al., 1998], though multi species flow is not uncommon.. The bottom panels of the Figure show TIDE measurements from three consecutive Polar passes with PSI operating, on June 8-9, 1997. In the top panel is shown the value of the Dst index through the month of June. The development of two component flow observed by TIDE during the second two passes seems to be correlated with the advent of enhanced storm activity, as shown in the Dst. However, this correlation is not one to one. Though not common, there are times observed when multi-species outflow is observed, but no remarkable signature is present in the Dst. In our database, we have characterized the flow, not only in the case of a single energy peak, but also in the case of multiple peaks. We are therefore in a position to study the occurrence and energetics of multi-species polar wind outflows. We will further exploit the database we have created to study the composition of the terrestrial polar wind outflow, and its dependence upon solar wind drivers and geomagnetic activity.



We note here the systematic decrease in typical flow energy as each pass progresses in the bottom panels of the figure. This type of effect is even more apparent later in the mission, when the apogee has precessed to lower latitude and northern polar cap passes include large variations in altitude. This systematic variation in flow energy may be either due to a velocity filter effect,or to an inherent variation in flow energy with altitude. We will investigate this type of observation to determine its origin.

Ionospheric Outflows Influences

Lead: J M Jahn/SwRI

We propose to continue to study the response of ionospheric ion outflow during geomagnetic storm periods. In order to investigate the relationship between ion outflow and magnetospheric conditions as well solar wind driving, we concentrate on perigee/low altitude passes. Although this restricts the amount of data considerably, it also minimizes the effects of spacecraft potential and allows us to perform the investigation independent of PSI operations. Earlier in the Polar mission, perigee passes afforded 2-4 30-minute snapshots of the ionospheric outflow conditions during various phases of a storm, all at more or less constant altitudes. With the apogee of Polar now close to the equatorial plane, "perigee" passes for the purpose of this study have moved to higher altitudes, sample a larger altitude range per pass, and typically last longer. This improves sampling of individual storms as well as offers the opportunity to study similar storms at different altitudes.

During 1996-1999, over 50 Dst storm periods were encountered by Polar. About 25% of the events detected at perigee were multi-species events (see Figure 3). There is no clear indication yet as to whether there are any similarities between those storms compared to "single-species" events as far as solar wind and geomagnetic activity conditions are concerned. Apparently, multi-species outflow at low altitudes is not a function of Dst.

With an extensive database on Dst storms in hand, we are in the position to perform a "modified superposed epoch" analysis, where we superpose consecutive low-altitude passes as well as low-altitude passes from different storms. The goal is to derive an "average" time history of outflow as a function of storm phase. This analysis works best for April 06, 2000 type events where there was an impulsive stimulus to the magnetosphere, but it should also yield good results for more complicated magnetospheric storms. The result is an average outflow timeline for various storm types.

The techniques for investigating storms can be extended to examining the behavior of outflow during substorms. Substorms happen on much shorter time scales, which in return means that a single low-altitude pass may cover a more substantial portion of a single event. This can help answer the question of how much the outflow is changing during the course of substorm events.

NSSTC Tasks

Lead: M O Chandler/NSSTC, with V. N. Coffey, N. Singh, P. D. Craven

Observations of the low-shear magnetopause. Currently this a case study of March 22, 2000 with Polar crossing the magnetopause and sampling the magnetosheath for several hours. Intend to expand to other cases and would like to extend to some modeling of distributions (hopefully with Liemohn and Kazanov's kinetic model) to identify ion sources, determine heating and transport mechanisms. (Chandler)

TIDE/LENA coincident observations of ion heating. Currently doing a survey for "conjunctions" between IMAGE and Polar. Goal is to quantify/localize heating region using side-view from LENA and TIDE in situ. (Chandler and Coffey)

Modeling/data comparison of ion heating in the cusp. Modeling and data comparison to determine heating mechanisms. (This will likely be Vic's thesis work when she passes comps.) (Coffey, Chandler, w/Singh)

Polar observations of ion heating in the cusp correlated with multiple ion injections (follow on to the EGS work that includes Nelson Maynard and Gordon Wilson) (Chandler, Craven)

Plasmaspheric ions near the dayside magnetopause (follow on to AGU talk). Study of source, transport and heating of plasmaspheric ions in the outer magnetosphere. This could involve IMAGE data as well. (Chandler)

Ring Current Feeding

Lead: J U Kozyra, with M. Liemohn, A. Nagy

It is proposed to examine the Polar-TIDE data set for observations of ions contributing to the stormtime ring current. TIDE, the thermal ion dynamics experiment, shuts off during the passage through the inner magnetosphere. This cutoff generally occurs around L=6. However, this leaves observational overlap with the outer ring current region. More significantly, it overlaps with the L shell of the geosynchronously-orbiting spacecraft operated by the Los Alamos National Laboratory (L=6.6), and therefore conjunctions and statistical correlations can be conducted between these two data sets. Of particular interest here is the quantification of the sub-keV ion population observed by the LANL satellites. They are ubiquitous in the LANL data throughout the nightside, especially during storms, and are not reproduced from a bi-Maxwellian (or bi-Lorentzian) moment reconstruction of the distribution function (see Figure below). They are strongest on the dawnside, as evident in the statistical study by Korth et al. [JGR, p. 25,047, 1999]. They have also been observed by the CRRES satellite [Collin et al., GRL, p. 141, 1993]. However, their source region and mechanism is still unknown (are they a low-energy tail of the plasma sheet population, an ionospheric outflow, or a magnetopause boundary layer plasma?), and their influence on the stormtime ring current is largely unexamined.

Tasks planned for this study include:
(1) Examine nightside/dawnside L=6-8 TIDE observations to quantitatively describe this population.
(2) Find nightside/morningside field-line conjunctions of Polar and a LANL satellite to quantify the field-line distribution of this population.
(3) Use these observational findings as an input population to our kinetic ring current model (the Michigan version of RAM) for specific storm events to calculate their trajectories through the inner magnetosphere and their contribution to stormtime effects such as magnetic perturbations and thermal plasma heating.
(4) Investigate the occurrence of plasmaspheric drainage plume material at the day magnetopause and its potential role in the regulation of day side low latitude reconnection.

While the entire TIDE data set will be considered, of particular interest is the recent years (especially last fall/winter) of data when the satellite apogee has precessed to lower latitudes, allowing TIDE measurements closer to the magnetic equator in this spatial region. The recent storms in October and November 2000 have been tentatively chosen for intensive examination.

From these tasks, it is hoped to address the issue of the source population of these low-energy ions as well as the influence of these ions during geomagnetic storms, including the possible role of plasmaspheric drainage to the dayside magnetopause.

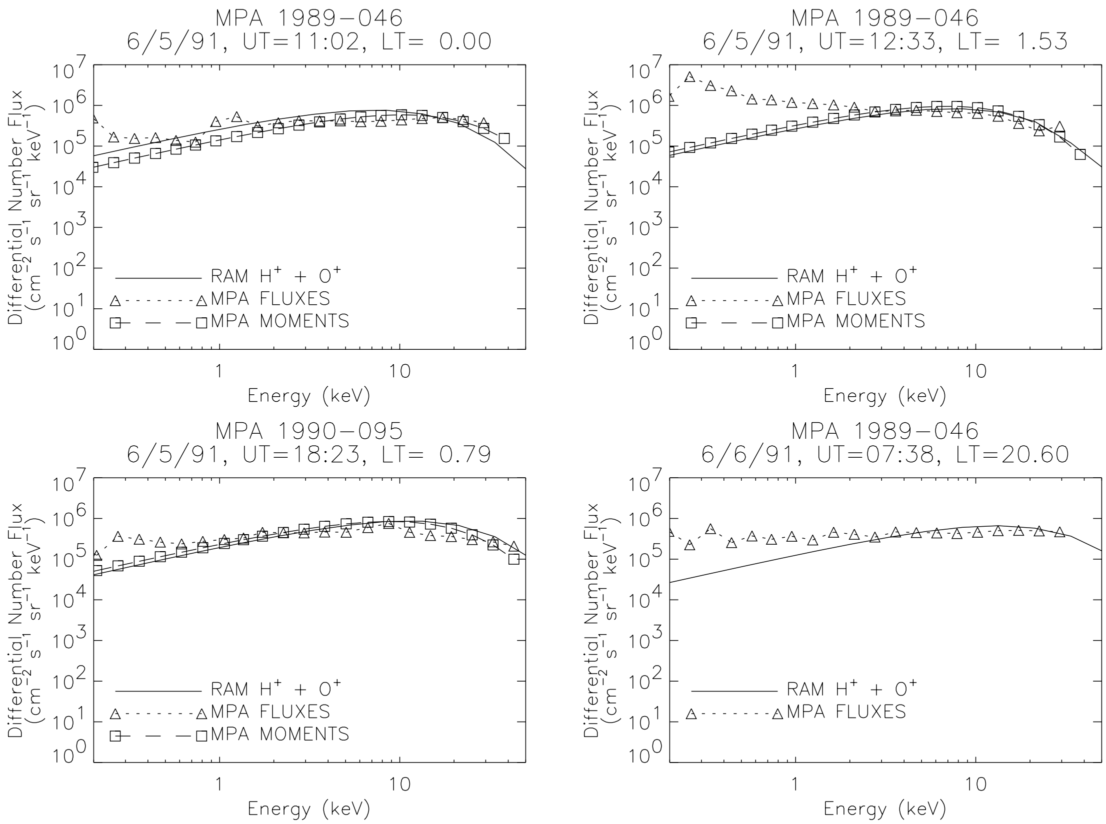


Figure Caption. Energy spectra from the magnetospheric plasma analyzer during the June 1991 magnetic storm. Also plotted are reconstructions of the spectra from the bi-Maxwellian moments of the data and also from the use of these moments in the RAM kinetic transport model.

UAH Proposed Tasks

Lead: J. L Horwitz, with R. H. Comfort and N. Singh

We will expand upon the multi-satellite DMSP-Polar observations of polar ionospheric flows during Polar Southern perigee passes by refining analysis programs for the post-summer 1996 TIDE observations/stops data to analyze the Polar/TIDE perigee data for the past 4 years, in combination with near-simultaneous DMSP measurements, as was done for the cases in April-May, 1996 [*Zeng et al*., 2001]. We believe it should be possible to separate the O^+ and H^+ measurements, at least in the polar cap region, through differences in ram energy and thermal spread. The expansion of the available parameter set from Polar (5000 km altitude)-DMSP (840 km altitude) will enable a number of comparisons under more varied circumstances, such as IMF conditions, local time differences, etc., than have been available with the April/May 1996 data set we have thus far concentrated on. One example question we would like to pursue with the expanded Polar/DMSP data sets is whether there are significant effects near the ionospheric terminator location. For example, Lyatsky et al 1999] showed how field-aligned currents and traveling convection vorticies can sometimes occur in the vicinity of E-region terminators, owing to the strong conductivity gradients possible there. We have already observed some effects in Polar ion densities at 5000 km altitude and electron temperatures at lower DE-2 altitudes related to the solar zenith angle [e.g., Wu et al., 2000; Su et al., 1999], but the effects we would be probing here could be more abrupt (at times) and associated with the FAC perhaps driven by E-region conductivity gradients. The extended Polar/DMSP data set indicated should enable us to investigate such possible terminator effects as well as other phenomena not extensively explored yet.

The initial effort to employ the DyFK model to simulate the variations of densities and parallel flow velocities[*Tu et al*., 2001] will be extended to other suitable cases selected from the expanded Polar/TIDE parameter data set above. At high altitudes, energy separation between H+ and O+ should make it possible to separate the two species in the stops data of the extended mission. As our initial study demonstrated, this separation is necessary since H+ and O+ respond to solar wind drivers differently. We propose to use the much larger set of stops data over a large range of solar activity to examine mass loading of the magnetosphere with heavy ions over a broad range of solar wind and solar activity parameters. Building on results of the detailed study from the 1996 data set [*Elliott et al*; 2001a], we will address primarily those drivers which were found to be important or which were inconclusive due to the small range of variability. Determining how mass loading varies with solar activity, which could not be addressed with the limited 1996 data set, will provide insight into the solar cycle variability of a number of important physical processes, from wave propagation and wave-particle interactions to the global circulation of heavy ions in the magnetosphere.

We also intend to pursue collaborative studies involving other spacecraft observations, for example with IMAGE/LENA observations of ionospheric outflows in conjunction with TIDE observations. A small effort in this direction has begun. Our group has also begun some DyFK and plasmasphere modeling of IMAGE/RPI measurements of densities in the polar cap and along plasmaspheric flux tubes, respectively. This may also lead to work involving TIDE measurements in the 2000 and later time frame with measurements from IMAGE/RPI and perhaps other IMAGE observations.

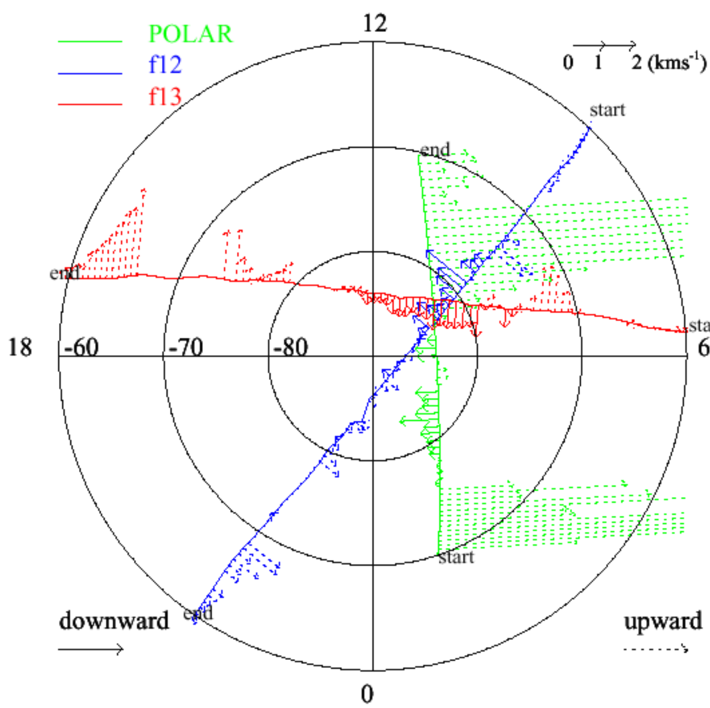


Figure HJ1(zengfig1b… file): Parallel/vertical velocity comparisons for Polar, DMSP 12 and DMSP 13 on April 13, 1996. Plot is in a polar invariant latitude(degree)-magnetic local time(hour) format. The time intervals for each spacecraft pass were: for Polar, 14:56:55-15:25:56 UT, for DMSP12, 14:35:00-14:53:00 UT, for DMSP 13, 14:36:48-14:55:36 UT. Solid portions of the velocity vectors are downward, while the dashed portions represent upward velocities. The velocity bar provides the linear calibration measure.[Zeng et al., 2001]

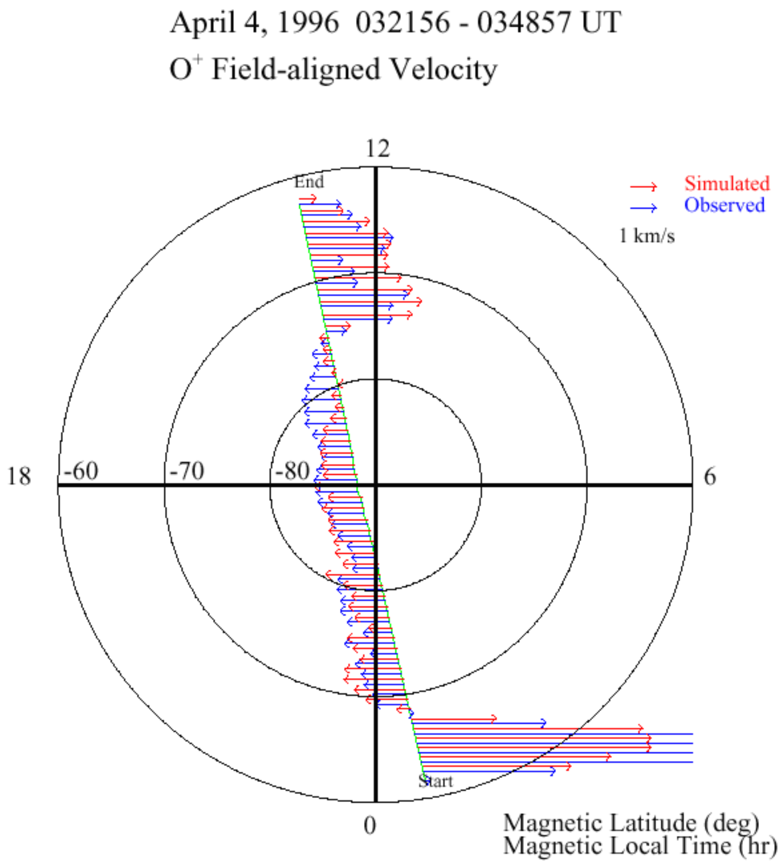


Figure HJ2(tufig96…file): O^+ parallel velocities measured(in blue) with Polar/TIDE near 5000 km altitude on April 4, 1996 for the indicated UT period of a Southern perigee Polar pass, compared with DyFK simulations(in red) of polar ionosphere transport between 120 km and several R_E altitude, for a flux tube as if it were convecting approximately along the Polar horizontal track. “Externally” varied parameters in the DyFK simulation were soft electron precipitation and transverse ion heating processes turned-on during the during the flux tube’s passage through the dayside cleft and nightside auroral regions, and variations in the high altitude electron temperature.[Tu et al., 2001].

Ionospheric Outflow Control by Solar Wind Parameters

B. L. Giles

We propose to investigate both the degree to which ionospheric plasma ejection processes are modified by the solar wind electric field, and the degree to which the transport of the ejected plasma (and therefore the presence of ionospheric plasma at any given tail location) is subject to modulation by the solar wind electric field. The availability of solar wind data from the WIND satellite upstream of Earth and of contemporaneous observations by Polar of ionospheric outflow affords an excellent opportunity to distinguish the characteristics of the solar wind and IMF that influence the morphology and intensity of ionospheric outflows across the entire dayside. We will use this data to search for the causative influences in the solar wind that drive outflows in both the pre-noon upwelling region and the post-noon/dusk portion of the dayside. Solar wind plasma density, velocity, momentum flux will be simply available or derivable from key parameters from the Solar Wind Experiment (SWE) on WIND, and IMF data will be used from WIND’s Magnetic Field Experiment (MFE) instrument. These will be correlated with ion heating and outflow measurements from TIDE for this study. GSFC has assembled databases of upwelling ion events observed by TIDE on Polar. This database will be used to correlate measurements of the outflowing H^+ and O^+ flux to variations in physical parameters characteristic of the propagated upstream interplanetary environment.

Global Circulation of Ionospheric Plasmas

Lead: C. R. Chappell, with M. Huddleston

We propose to investigate the circulation of ionospheric plasmas in the magnetosphere through a combination of statistical study of the database, in correlation with datasets from Geotail and Cluster II, and comparison of these observations with 3D particle simulations. We have completed initial mapping of outflowing dayside polar wind ions to various magnetospheric locations. Comparison of TIDE/PSI Polar wind observations with model trajectory results and previous DE/RIMS and Akebono data have also been performed. We will develop a statistical pitch angle distribution survey of low energy outflowing ionospheric ions from the mass-resolved TIDE data set. Collection of data from other ISTP spacecraft will also be performed in order to analyze the processing of low energy ion energization in the plasma sheet. The 3D particle trajectory code of Delcourt will be used to determine the degree to which observed behaviors are understood. These studies will form the basis of JGR papers on the results of our statistical pitch angle distribution survey of low energy outflowing ionospheric ions, on the mapping out the ultimate destination of all outflowing polar wind ions using model trajectory results and the TIDE/PSI data set, as well as other relevant instrument data sets. We will seek to explain high altitude observations in terms of model results and low altitude input parameters. We will then check earlier estimates of the total contribution of ionospheric ions to the plasma sheet. Finally, we will estimate the overall degree to which plasma throughout the magnetosphere is supplied by the earth's ionosphere.

BUDGET [1]

TIDE-PSI Polar Extended Mission Cost Plan
FY02-FY04 Annual Cost Plan in FY02k$

Inst.	Staffing	Wkyr	Cost	Supplies/ Services	Travel	Overhead	Equip.	TOTAL
GSFC	Moore, Giles, Vaisberg, tbd	1.6	50	3.0	0	7	0.0	70
NSSTC	Chandler, Craven, Coffey, Johnson, CSC	2	146.2	4.0				100
SwRI	Pollock, Jahn, Valek	0.5	100.0					70
UAH	Horwitz, Comfort, Students	4.2	76.4		10.7	37.5		90
VU*	Chappell, Student	1.2	40.5		7.9	21.5		70
UM	Nagy, Liemohn	0.3	29.0	2.0	3.0	16.4		50
TOTAL								450

* Vanderbilt is prepaid through FY02.

TIDE-PSI Solar Max Initiative Cost Plan
GSFC Cost Plan in FY02k$

Description	Qty.	Rate	Cost
Civil service workforce	1	11.7	12
On-site non-CS Scientist (fully burdened with overhead)	0.6	84	50
Supplies and Services (software, publication charges, ...)			3
Travel (non-CS)			0
Overhead (7% of GSFC-specific funding))			7
Equipment			
TOTAL			70

APPENDIX A. Publications and Presentations

(see http://satyr.msfc.nasa.gov/TIDE/papers.html for updates)

Theses

Elliott, H. A., Solar wind influence on ion outflow, Ph.D. dissertation, Univ. of Ala. in Huntsville, 2001.

TIDE Team Authored

Moore, T. E., C. R. Chappell, M. O. Chandler, S. A. Fields, C. J. Pollock, D. L. Reasoner, D. T. Young, J. L. Burch, N. Eaker, J. H. Waite, Jr., D. J. McComas, J. E. Nordholt, M. F. Thomsen, J. J. Berthelier, and R. Robson, The Thermal Ion Dynamics Experiment and Plasma Source Instrument, Space Sci. Revs., 71, p.409, 1995.

Moore, T.E., C.R. Chappell, M.O. Chandler, P.D. Craven, B.L. Giles, C.J. Pollock, J.L. Burch, D.T. Young, J.H. Waite, Jr., J.E. Nordholt, M.F. Thomsen, D.J. McComas, J.J. Berthelier, W.T. Williamson, R. Robson, and F.S. Mozer, High altitude observations of the polar wind, *Science*, 277, 349, 1997.

Comfort, R.H., Moore, T.E., Craven, P.D., Pollock, C.J., Mozer, F.S., and W.T. Williamson, Spacecraft potential control by on the POLAR satellite, J. Spacecraft and Rockets, 35(6), p.845, 1998.

Dempsey, D. L., J. L. Burch, M.M. Huddleston, C.J. Pollock, J.H. Waite, Jr., M. Wüest, T.E. Moore, and E.G. Shelley, Reflected solar wind ions and downward accelerated ionospheric ions during the January 1997 magnetic cloud event, Geophys. Res. Lett., 25(15), p.2979, 1998.

Hirahara, M., J. L. Horwitz, T. E. Moore, G. A. Germany, J. F. Spann, W. K. Peterson, E. G. Shelley, M. O. Chandler, B. L. Giles, P. D. Craven, C. J. Pollock, D. A. Gurnett, J. S. Pickett, A. M. Persoon, J. D. Scudder, N. C. Maynard, F. S. Mozer, M. J. Brittnacher, and T. Nagai, Relationship of topside ionospheric ion outflows to auroral forms and precipitation, plasma waves, and convection observed by POLAR, J. Geophys. Res., 103(A8), p.17391, 1998.

Hirahara, M., J. L. Horwitz, T. E. Moore, M. O. Chandler, B. L. Giles, P. D. Craven, and C. J. Pollock, POLAR observations of properties of H+, and O+ conics in the cusp near 5300 km altitude, Geophysical Monograph #104, Am. Geophys. Un., Washington, DC, p.107, 1998.

Moore, T. E., C. J. Pollock, and D. T. Young, Kinetic core plasma diagnostics, in “Measurement techniques in space plasmas”, J. Borovski, R. Pfaff, and D. T. Young, eds., Geophysical Monograph #102, p.105, 1998.

Su, Y.-J., J. L. Horwitz, T. E. Moore, M. O. Chandler, P. D. Craven, B. L. Giles, M. Hirahara, and C. J. Pollock,, Polar wind survey with the TIDE/PSI suite aboard Polar, J. Geophys. Res. 103(A12), 29305, 1998.

Chandler, M. O, S. A. Fuselier, M. Lockwood, and T. E. Moore, Evidence for component merging equatorward of the cusp, J. Geophys. Res., 104(A10), p.22623, 1999.

Moore, T. E., M. O. Chandler, C. R. Chappell, R. H. Comfort, P. D. Craven, D. C. Delcourt, H. A. Elliott, B. L. Giles, J. L. Horwitz, C. J. Pollock, and Y.-J. Su, Polar/TIDE results on polar ion outflow, in *Physics of Sun-Earth Plasma and Field Processes*, edited by J. L. Burch, R. L. Carovillano, and S. Antiochos, *Geophysical Monograph No. 109, Am. Geophys. Un.*, Washington, DC, pp. 87, 1999.

Moore, T. E., R. Lundin, et al., Source processes in the high latitude ionosphere, Space Sci. Revs., 88(1-2), p.7, 1999.

Moore, T. E., W. K. Peterson, C. T. Russell, M. O. Chandler, M. R. Collier, H. L. Collin, P. D. Craven, R. Fitzenreiter, B. L. Giles, and C. J. Pollock, Ionospheric mass ejection in response to a CME, *Geophys. Res. Lett.*, 26(15), pp. 2339-2342, 1999.

Moore, T.E., M.O. Chandler, C.R. Chappell, R.H. Comfort, P.D. Craven, D.C. Delcourt, H.A. Elliott, B.L. Giles, J.L. Horwitz, C.J. Pollock, and Y.-J. Su, Polar/TIDE results on polar ion outflow, in "Physics of Sun-Earth Plasma and Field Processes, ed. by J.L. Burch, R.L. Carovillano, and S. Antiochos, Geophysical Monograph No. 109, Am. Geophys. Un., Washington, DC, p. 87, 1999.

Wu, X-Y., J. L. Horwitz, G. M. Estep, Y.-J. Su, D. G. Brown, P. G. Richards, and G. R. Wilson, Dynamic fluid-kinetic(DyFK) modeling of auroral plasma outflow driven by soft electron precipitation and transverse ion heating, *J. Geophys. Res., 104*, 17263, 1999.

Chappell, C. R., B. L. Giles, T. E. Moore, D. C. Delcourt, P. D. Craven, and M. O. Chandler, The adequacy of the ionospheric source in supplying magnetospheric plasma, J. Atm. Solar Terr. Physics, 62(6), p.421, 2000.

Horwitz, J. L., and T. E. Moore, Core Plasmas in Space Weather Regions, IEEE Trans, in press, 2000.

Huddleston, M.M., C.J. Pollock, J.S. Pickett, M.P. Wüest, T.E. Moore, W.K. Peterson, Toroidal Ion Distributions Observed at High Altitudes Equatorward of the Cusp, Geophys. Res. Lett, 27(4), p.469, 2000.

Stevenson, B. A., J. L. Horwitz, B. Creel, H. A. Elliott, R. H. Comfort, Y. J. Su, T. E. Moore, and P. D. Craven, Relationship of O+ Field-Aligned Flows and Densities to Convection Speed in the Polar Cap at 5000 km Altitude, J. Atm. Solar Terr. Physics 62(6), p.495, 2000.

Wu, X.-Y., J. L. Horwitz, and Y. Seo, Statistical analysis of F-region and topside ionospheric ion field-aligned flows at high latitudes, *J. Geophys. Res. 105*, 24777, 2000.

Elliott, H. A., R. H. Comfort, P. D. Craven, M. O. Chandler, and T. E. Moore, Solar wind influence on the oxygen content of ion outflow in the high altitude polar cap during solar minimum conditions, J. Geophys. Res., 106, 6067, 2001.

Moore, T. E., M.O. Chandler, M.-C. Fok, B.L. Giles, D.C. Delcourt, J.L. Horwitz, C.J. Pollock, Ring Currents and Internal Plasma Sources, Space Science Reviews 95(1/2): 555-568, January, 2001

Singh, N., W. C. Leung, T. E. Moore, and P. D. Craven, Numerical model of the plasma sheath generated by the Plasma Source Instrument aboard the POLAR spacecraft, J. Geophys. Res. 106(A9), p.19179, 2001.

Song, P

Stevenson, B. A., J. L. Horwitz, G. Germany, T. E. Moore, P. D. Craven, M. O. Chandler, B. L. Giles, Y.-J. Su and G. K. Parks, Polar observations of topside field-aligned O^+ flows and auroral forms, *J. Geophys. Res.*, 106(A9), p.18969, 2001.

Su, Yi-Jiun, Joseph E. Borovsky, Michelle F. Thomsen, Nicolas Dubouloz, Michael O. Chandler, and Thomas E. Moore, Plasmaspheric Material on High-Latitude Open Field Lines, J. Geophys. Res., 106(A4), p.6085, 2001.

Valek, P.W., J. D. Perez, J.-M. Jahn, C. J. Pollock, M. P. Wuest, R.H.W. Friedel, T. E. Moore, and W. K. Peterson, Outflow from the Ionosphere in the vicinity of the Cusp, J. Geophys. Res., in press, 2001.

Zeng, W., J. L. Horwitz, B. A. Stevenson, X.-Y. Wu, Y.-J. Su, P. D. Craven, F. J. Rich, and T. E. Moore, Near-simultaneous POLAR and DMSP Measurements of Topside Ionospheric Field-Aligned Flows at High Latitudes, J. Geophys. Res. 105, in press, 2001.

Elliott, H. A., R. H. Comfort, P. D. Craven, T. E. Moore, M. O. Chandler, and C. T. Russell, Directly driven ion outflow observed in the high altitude polar cap, J. Geophys. Res., in preparation, 2002.

Collaborator Authored

Laakso, D.H. Fairfield, M.R. Collier, H. Opgenoorth, T.-D. Phan, D.G. Sibeck, B.L. Giles, H.J. Singer, R.P. Lepping, R.P. Lin, F.S. Mozer, R.F. Pfaff, K. Tsuruda, and J.R. Wygant, Oscillations of Magnetospheric Boundaries Driven by IMF Rotations, Geophys. Res. Lett., 25(15), 3007-3010, 1998.

Laakso, H., D.H. Fairfield, C.T. Russell, J.H. Clemmons, H.J. Singer, B.L. Giles , R.P. Lepping, F.S. Mozer, R.F. Pfaff, K. Tsuruda, and J.R. Wygant, Field-Line Resonances Triggered by a Northward IMF Turning, Geophys. Res. Lett., 25(15), 2991-2994, 1998.

Russell, C. T., J. A. Fedder, S. P. Linker, X.-W. Zhou, G. Le, J.G. Luhmann, F.R. Fenrich, M.O. Chandler, T. E. Moore, and S. A. Fuselier, Entry of the POLAR spacecraft into the polar cusp under northward IMF conditions, Geophys. Res Lett., 25(15), p.3019, 1998.

Song, P., T. I. Gombosi, D. L. DeZeeuw, K. G. Powell, and C. P. T. Groth, A model of solar wind-magnetosphere-ionosphere coupling for Northward IMF, Geophys. Res. Lett., in review, 1998.

Strangeway, R. J., C. T. Russell, C. W. Carlson, J. P. McFadden, R. E. Ergun, M. Temerin, D. M. Klumpar, W. K. Peterson, T. E. Moore, Cusp Field-Aligned Currents and Ion Outflows, J. Geophys. Res. 105(A9), p.21129, 2000.

Wuest, M., M.M. Huddleston, J.L. Burch, D.L. Dempsey, P.D. Craven, M.O. Chandler, J.F. Spann, W.K. Peterson, H.L. Collin, O.W. Lennartsson, Magnetospheric Response To The Arrival Of The Shock Wave In Front Of The Magnetic Cloud Of January 10, 1997, *Advances in Space Research*, © 2000 Cospar.

Cladis, J. B, H. L. Collin, O. W. Lennartsson, T. E. Moore, W. K. Peterson, and C. T. Russell, Observations of centrifugal acceleration during compression of the magnetosphere, Geophys. Res. Lett., 27(7), p.915, 2000.

Dubinen, E., A. Shalsky, P. Song, S. Savin, J. Kozyra, T. E. Moore, C. T. Russell, M. O Chandler, A. Fedorov, L. Avanov, J.-A. Sauvaud, and R. H. Friedel, Polar-Interball coordinated plasma and magnetic field characteristics in the regions of northern and southern distant cusps, J. Geophys. Res. 106, in press, 2001.

Delcourt, D.C., T. E. Moore, B. L. Giles, and M.-C. Fok, Quantitative Modeling Of Modulated Ion Injections Observed By Polar-Tide In The Cusp Region, J. Geophys. Res., in review, 2000.

Song, P.,J.U.Kozyra, M.O.Chandler, C.T.Russell ,W.K.Peterson, K.J.Trattner, R.H.W.Friedel, J.-H.Shue, T.E.Moore, K.W.Ogilvie, R.P.Lepping, D.J.McComas, POLAR observations and model predictions during May 4,1998, magnetopause, magnetosheath and bowshock crossings, J. Geophys. Res., 106(A9), p.18927, 2001.

Vaisberg, O. L., T. E.Moore, L.A.Avanov, and V. N.Smirnov, The Ion Flow Signatures in Two Types of LLBL , J. Geophys. Res., in review, 2001.

TIDE Team Presented

Chandler, M.O., P. D. Craven, B. L. Giles, T. E. Moore, C. J. Pollock, J.H. Waite, D.T. Young, J.L. Burch, J. E. Nordholt, J.R. Wygant, C.T. Russell, Plasma Transport in the Cleft, Entry Layer, and Lobes, Eos Trans. AGU, 77(46), F603, 1996.

Comfort, R. H., H. A. Elliott, P. D. Craven, M. O. Chandler, D. L. Gallagher, and T. E. Moore, Core plasma ion temperatures form Polar/TIDE, Fall Meeting of the American Geophysical Union, San Francisco, CA, December 15-19, 1996.

Comfort, R. H., P. D. Craven, D. L. Gallagher, and T. E. Moore, Core plasma ion temperatures from Polar/TIDE, presented at the Huntsville96 Workshop on "Encounter between 3D Global Models and Observations in the ISTP Era", Guntersville, AL, Sept. 1996.

Elliott, H. A., R. H. Comfort , P. D. Craven, M. O. Chandler, and T. E. Moore, Preliminary ion velocities obtained using TIDE, Huntsville Workshop on Encounter Between Global Observations and Models in the ISTP Era, Guntersville State Park, Guntersville, AL September 15-20,1996.

Giles, B. L., P. D. Craven, M. O. Chandler, T. E. Moore, R. H. Comfort, The search for He+, Eos Trans. AGU, 77(46), F608, 1996.

Hirahara, M., J. L. Horwitz, G. Germany, T. E. Moore, J. M. Spann. M. Chandler, and B. L. Giles, "Properties of up-flowing ionospheric ion conics and magnetosheath observations from the TIDE and UVI instruments on Polar", Huntsville ISTP Workshop, Guntersville, Ala., September,1996.

Horwitz, J. L., and T. E. Moore, "On High-Latitude Ionospheric Outflows into the Magnetosphere", presented to the Workshop on "Sources and Losses of Magnetospheric Plasmas", International Space Science Institute, Bern, Switzerland, October, 1996.

Horwitz, J. L., G. Kunin, M. Hirahara, G. Germany, D. G .Brown, J. A. Spann, T. Nagai, and R. Lepping , "Auroral and magnetospheric activity during intervals of steady southward interplanetary magnetic field from ISTP Polar and WIND observations", presented to 1996 Fall AGU meeting, San Francisco, CA, Dec. 1996.

Horwitz, J. L., M. Hirahara, T. E. Moore, M. O. Chandler, P. D. Craven, B.L . Giles, C. J. Pollock "High and low altitude observations of the Polar cusp by TIDE/PSI", June, 1996 GEM meeting, Snowmass, CO., 1996.

Horwitz, J. L., T. Nagai, Y. Saito, T. Yamamoto, T. Mukai, A Nishida, S. Kokubun, M. Hirahara, G. Germany, J. Spann, M. Brittnacher, "GEOTAIL-Polar simultaneous observations of substorm onsets", presented to Fall AGU meeting, San Francisco, CA., 1996.

Moore, T. E., Earth's Plasma Fountains, presented at the press conference on ISTP results at the Fall AGU meeting, San Francisco, CA, Dec. 1996.

Moore, T.E., M. O. Chandler, P. D. Craven, B. L. Giles, M. Hirahara, J. L. Horwitz, and C. J. Pollock, Plasma Transport in the Magnetospheric Cleft, presented at the Huntsville96 Workshop on "Encounter between 3D Global Models and Observations in the ISTP Era", Guntersville, AL, Sept. 1996.

Moore, T.E., M.O. Chandler, C.R. Chappell, C.J. Pollock, J. L. Burch, J.H. Waite, D.T. Young, D.J. McComas and J.E. Nordholt, J.J. Berthelier, Initial Results from the Thermal Ion Dynamics Experiment (TIDE) and the Plasma Source Investigation (PSI) on Polar, Eos Trans. AGU, 77(17), p.S251, 1996.

Moore, T.E., M.O. Chandler, C.R. Chappell, C.J. Pollock, J. L. Burch, J.H. Waite, D.T. Young, D.J. McComas and J.E. Nordholt, J.J. Berthelier, Initial Results from the Thermal Ion Dynamics Experiment (TIDE) and the Plasma Source Investigation (PSI) on Polar, Eos Trans. AGU, 77(17), p.S251, 1996.

Moore, T.E., M.O. Chandler, C.R. Chappell, C.J. Pollock, J.H. Waite, Jr., D.T Young, D.J. McComas and J. E. Nordholt, and J.J. Berthelier, Initial Results from the Thermal Ion Dynamics Experiment (TIDE) and the Plasma Source Investigation (PSI) on the Polar Satellite, presented at the 31st COSPAR Scientific Assembly, Symposium D0.1, ISTP Program, Birmingham, U.K., July 1996.

Borovsky, Joseph E., Richard C. Elphic, Michelle F. Thomsen, David J. McComas , R H Comfort, Paul D. Craven, T E Moore, Forrest Mozer, A Search for Plamsapheric Material in the Lobe Using ISTP, Eos Trans., AGU, 78(17), S309, 1997.

Chappell, C R, B L Giles, D C Delcourt, T E Moore, M O Chandler and P D Craven, Magnetospheric Plasmas - Flow and Energization of the Ionospheric Source, Fall AGU, December 8-12, 1997.

Comfort, R. H., H.A. Elliott, P.D. Craven, M.O. Chandler, T.E. Moore, M. Wuest, M. Huddleston, and W. Lennartsson, Ion distribution moments from Polar/TIDE and comparisons with Polar/TIMAS, EOS, Transactions, American Geophysical Union, 1997 Spring Meeting (Baltimore), Vol. 78, No. 17, Pg. S295, April 29, 1997.

Comfort, R.H., T. E. Moore, P. D. Craven, C. J. Pollock, F. S. Mozer, and W. T. Williamson, Spacecraft potential control by PSI on the Polar satellite, invited presentation to the 24th IEEE International Conference on Plasma Science, San Diego, CA, 19-22 May, 1997.

Comfort, R.H., T.E. Moore, P.D. Craven, C.J. Pollock, F.S. Mozer, and W.T. Williamson, Spacecraft potential control by PSI on the Polar satellite, presented at the 28th Plasmadynamics and Lasers Conference of the American Institute of Aeronautics and Astronautics, Atlanta GA, June 1997.

Craven, P.D., T.E. Moore, M.O. Chansker, R.H. Comfort, E.G. Shelley, W.K. Peterson, C. Pollock, M. Wüest, M. Huddleston, and D. Dempsey, Observations of polar wind during the magnetic cloud event of January 10 and 11, 1997, EOS, 78 (17), 1997 Supplement, Presented at the Spring 1997 Meeting of the AGU, May, 1997.

Elliott, H.A., R.H. Comfort, P.D. Craven, M.O. Chandler, T.E. Moore, F.S. Mozer, and C.T. Russell, Thermal ion flow velocities as measured by TIDE, and inferred by EFI and MFE, CEDAR Meeting, Boulder CO, June 1997.

Elliott, H.A., R.H. Comfort, P.D. Craven, M.O. Chandler, T.E. Moore, N.C. Maynard, W.K. Peterson, O.W.Lennartsson, E. G. Shelley, F.S. Mozer, and C.T. Russell, Ion outflow and convection in the polar cap measured by TIDE, EFI, and MFE on Polar, EOS , Transactions, American Geophysical Union, 1997 Fall Meeting (San Francisco), Vol. 78, No. 46, Pg. F623, November 18, 1997b.

Elliott, P.D. Craven, M.O. Chandler, T.E. Moore, C.J. Pollock, M. Wüest, M. Huddleston, W. Lennartsson, and E.G. Shelley, Ion distribution moments from Polar/TIDE and comparisons with Polar/TIMAS, EOS, 78 (17), 1997 Supplement, Presented at the Spring 1997 Meeting of the AGU, May, 1997.

Giles, B L, C R Chappell, D C Delcourt, T E Moore, M O Chandler and P D Craven, Magnetospheric Plasmas - A Direct Measurement of the Ionospheric Source, Fall AGU, December 8-12, 1997.

Giles, B. L., T. E. Moore, M. O. Chandler, P.D. Craven, C. J. Pollock,The Upwelling Ion Source of Low Energy Ions: Initial Results from TIDE/PSI on Polar, Eos Trans., AGU, 78(17), S293, 1997.

Horwitz, J. L., and T. E. Moore, "Outflow of ionospheric core plasmas into the magnetosphere: Recent simulation and observations from the thermal ion dynamics experiment/plasma source instrument on-board the Polar spacecraft", presented to International Symposium on Solar-Terrestrial Coupling Processes, Paros, Greece, June, 1997.

Huddleston, M M, J H Waite, C J Pollock, D T Young, M Wuest, J.L. Burch, R H Comfort, BL Giles, M O Chandler, T E Moore,R. West ,W Lennartsson, E G Shelley, H Collin, W K Peterson, and A Johnstone, Comparisons of Conical Ion Velocity Distributions from TIMAS and TIDE on the Polar Spacecraft, Eos Trans. AGU, 78(17), S271, 1997.

Huddleston, M.M., C.J. Pollock, M. Wüest, J.L. Burch, W.K. Peterson, H.L. Collin, W.W. Lennartsson, J. Pickett, and T.E. Moore, Observations of O+ outflow in a double auroral encounter of the Polar spacecraft during the magnetic cloud event of January 10 and 11, 1997, EOS, 78 (46), 1997 Supplement, Presented at the Fall 1997 Meeting of the AGU, December, 1997.

Moore, T.E., B.L. Giles, M.O. Chandler, C.R. Chappell, P.D. Cravens, Y.J. Su, J.L. Horwitz, and C.J. Pollock, Polar wind in the context of the auroral plasma fountain from 2 to 8 R_E, EOS, 78 (46), 1997 Supplement, Presented at the Fall 1997 Meeting of the AGU, December, 1997.

Moore, T.E., M.O. Chandler, P.D. Craven, B.L. Giles, C.J. Pollock, and D.C. Delcourt, Low Energy and Heavy Ion Content of Polar Plasma Outlfows, EOS, 78 (17), 1997 Supplement, Presented at the Spring 1997 Meeting of the AGU, May, 1997.

Pollock, C J, J L Burch, J H Waite, Jr., M Wuest, D T Young, T E Moore, M O Chandler, P D Craven, E G Shelley, W K Peterson, P H Reiff, F Toffoletto, D L Dempsey, M M Huddleston, O L Vaisberg, L Avanov, V Smirnov, ISTP Observations of Magnetospheric ion Plasma Transport During the January 1997 Magnetic Storm, Eos Trans, AGU, 78(17), S284, 1997.

Song, P., J. U. Kozyra, M. O. Chandler, T. E. Moore, and C. T. Russell, Polar Observations of Magnetosheath Plasmas: TIDE Measurements of Thermal Plasma Properties, presented at the International Association of Geomagnetism and Aeronomy (IAGA), 8th Scientific Assembly, Uppsala, Sweden, August 1997.

Su, Y.J., J.L. Horwitz, M. Hirahara, T.E. Moore, M.O. Chandler, B.L. Giles, P.D. Craven, C.J. Pollock, and J. Scudder, Survey of the Polar Wind from 5000 km to 8 R_E Altitude with Polar, EOS, 78 (17), 1997 Supplement, Presented at the Spring 1997 Meeting of the AGU, May, 1997.

Su, Y.J., J.L. Horwitz, T.E. Moore, M.O. Chandler, P.D. Craven, B.L. Giles, and C.J. Pollock, Polar wind survey with TIDE/PSI suite aboard Polar, EOS, 78 (46), 1997 Supplement, Presented at the Fall 1997 Meeting of the AGU, December, 1997.

Chandler, M. O., T. E. Moore, and. C. T. Russell, Ion signatures of reconnection, Toward solar max 2000: The present achievements and future opportunities of ISTP and GEM, Yosemite, CA, Febuary 10-13, [1998]

Comfort, R.H., H.A. Elliott, P.D. Craven, M.O. Chandler, T.E. Moore, C.J. Pollock, Polar/TIDE Ion Convection Observations at High Latitudes, Toward solar max 2000: The present achievements and future opportunities of ISTP and GEM, Yosemite, CA, Febuary 10-13, [1998]

Craven, P D, T E Moore, M F Thomsen, J E Borovsky, W K Peterson, R H Comfort, Observations of the Plasmasphere with Polar/TIDE, Polar/TIMAS and LANL/MPA Instruments, Spring 1998 AGU Meeting, May 1998.

Craven, P. D., V. N. Coffey, J. Wygant, T. E. Moore, "A search for low energy plasma in auroral density cavities", *Toward solar max 2000: The present achievements and future opportunities of ISTP and GEM*, Yosemite, CA, Febuary 10-13, [1998].

Elliott, H.A. R.H. Comfort, P.D. Craven, K.B. Baker, T.E. Moore, C.T. Russell, Simultaneous ion convection in the polar magnetosphere and ionosphere, AGU, Boston, May, 1998.

Horwitz,J. L., Y.-J. Su, T. E. Moore, M. O. Chandler, P. D. Craven, B.L . Giles, C. J. Pollock, "Survey of the polar wind with TIDE/PSI and HYDRA on the Polar spacecraft", to be presented to Cambridge Multi-Scale Processes Workshop, Lisbon, Portugal, June, 1998.

Kozyra, J. U., P. Song, M. O. Chandler, T. E. Moore, M. P. Wuest, C. T. Russell and R. R. Anderson, Multi-Instrument, Multi-Spacecraft Analysis of the June 20, 1996 Cusp Crossing by the Polar Spacecraft during Northward IMF Conditions, to be presented at the Spring AGU meeting, 1998.

Moore, T. E., C. J. Pollock, B. L. Giles, M. O. Chandler, C. R. Chappell, P. D. Craven, Y.-J. Su, R. H. Comfort, H. A. Elliott, J. L. Horwitz, and D. C. Delcourt, Polar TIDE results on polar ion outflow, Yosemite Meeting, 1998.

Moore, T. E., P. D. Craven, N. Singh, and R. H. Comfort, Neutralization of photoelectric charging to enable core plasma measurements, Spring AGU Meeting, Boston, May, 1998.

Pollock, C.J., T.E. Moore, B.L. Giles, M.O. Chandler, C.R. Chappell, P.D. Caven, Y.-J. Su, R.H. Comfort, H.A. Elliott, J.L. Horwitz, N. Singh, D. Thompson, TIDE and PSI on Polar: Detailed Polar ion Outflow Observations and the nature of the Spacecraft Sheath,Toward solar max 2000: The present achievements and future opportunities of ISTP and GEM, Yosemite, CA, Febuary 10-13, [1998]

Su, Y-J., J. L. Horwitz, T. E. Moore, M. O. Chandler, P. D. Craven, B.L . Giles, C. J. Pollock, S. W. Chang, and J. Scudder "Polar wind and low-energy electron measurements at Polar apogee", to be presented to Spring AGU meeting, Boston, Mass, May, 1998.

Su, Y-J., J. L. Horwitz, T. E. Moore, M. O. Chandler, P. D. Craven, B.L . Giles, C. J. Pollock, S. W. Chang, and J. Scudder "Polar wind measurements with TIDE/PSI and HYDRA on the Polar spacecraft", to be presented to Western Pacific Meeting AGU meeting, Taipei, Taiwan, July, 1998.

Chandler, M. O., P. D. Craven, T. E. Moore, Ion signatures of magnetospheric regions and boundaries: the September 24, 1998 CME Event, EOS Trans. AGU, 80(17), p.S245, 1999.

Craven, P. D., J. F. Spann, Jr., M. O. Chandler, G. A. Germany, and T. E. Moore, Ionospheric response to the CME passage of September 24, 1998, EOS Trans. AGU, 80(17), p. S249, 1999.

Fok, M.-C., T. E. Moore, R. A. Wolf, and R. W. Spiro, New developments on ring current modeling, EOS Trans. AGU, 80(17), p.S298, 1999.

Fok, M.-C., T. E. Moore, S. Slinker, J A Fedder, Non-adiabatic behavior of heavy ions in the magnetotail during IMF southward turning, EOS Trans. AGU 80(46), p.F848, 1999.

Giles, B. L., T. E. Moore, C. J. Pollock, J.-M. Jahn, P. Valek, On the nature of terrestrial ion outflows in the absence of a solar wind driver, EOS Trans. AGU, 80(46), p.F864, 1999.

Huddleston, M.M., C.J. Pollock, M.P. Wuest, J.S. Pickett, T.E. Moore, W.K. Peterson, High Altitude Toroidal Ion Distribution Functions Observed Near The Equatorward Cusp Boundary, ISTP/Polar Team Meeting, Greenbelt, MD, 1999.

Jahn, J.-M., B. L. Giles, T. E. Moore, W. K. Peterson, C. J. Pollock, P. Valek, M. P. Wuest, Ionospheric outflow as a function of geomagnetic activity during 1996-1999 storms., EOS Trans AGU, 80(46), p.F832, 1999.

Kozyra, J. U., P. Song, M. O. Chandler, T. E. Moore, C. T. Russell, S. S. Stahara, J. R. Spreiter, and J.-H. Shue, Polar Magnetosheath observations on May 4, 1998, EOS Trans. AGU, 80(17), p.S288, 1999.

Moore, T. E., M.-C. Fok, and B. L. Giles, Internal plasma sources and magnetospheric inflation, EOS Trans. AGU, 80(46), p.F905, 1999.

Stevenson, B. A., J. L. Horwitz, G. Germany, P. D. Craven, M. O. Chandler, T. E. Moore, B. L. Giles, G. K. Parks, C. J. Pollock, Y.J. Su, Polar/TIDE observations of field-aligned O+ flows at 5000 km altitude over the auroral regions in comparison with UVI auroral images, EOS Trans. AGU, 80(17), p.S292, 1999.

Chappell, C.R., M.M. Huddleston, B.L. Giles, T.E. Moore, Ionosperic Outflow And Energization In The Dayside Magnetosphere And Polar Cap, 2000 Spring AGU Meeting, Washington D.C.

Coffey, V N, T E Moore, M O Chandler, B L Giles, P D Craven, The response of the ionospheric cusp to the solar wind through two perspectives: low energy charged particle in situ measurements and low energy neutral atom imaging, EOS Trans. AGU, 81(48),p.F1036, 2000.

Coffey, V. N., M. O. Chandler, and T. E. Moore, A study of magnetospheric-ionospheric coupling processes in the cusp, EOS Trans. AGU, 81(19), p.S391, 2000.

Coffey, V. N., T. E. Moore, M. O. Chandler, and P. D. Craven, The response of the ionospheric cusp to the solar wind through two perspectives: Low energy charges particle in situ measurements and low-energy neutral atom imaging, Eos, 81(48), F1036, 2000.

El Marji, B., B. L. Giles, T. E. Moore, M. O. Chandler, and H. A. Elliott, Auroral plasma fountain and polar wind during rising solar activity, EOS Trans. AGU, 81(19), p. S391, 2000.

Elliott, H. A., R. H. Comfort, P. D. Craven, M. O. Chandler, and T. E. Moore, Solar wind influence on the oxygen content of ion outflow in the high altitude polar cap during solar minimum conditions, *EOS 81*, S370, 2000.

Elliott, H. A., R. H. Comfort, P. D. Craven, M. O. Chandler, and T. E. Moore, Case study of solar wind and IMF influences on ionospheric outflow, Huntsville 2000 Workshop.

Elliott, H. A., R. H. Comfort, P. D. Craven, M. O. Chandler, and T. E. Moore, Case study of solar wind and IMF influence on ionospheric outflow, presented to the *Huntsville 2000 Workshop – A New View of Geospace*, Callaway Gardens, Pine Mountain, GA October 30 – November 3, 2000b.

Fok, M-C, R W Spiro, R A Wolf, and T E Moore, Comprehensive computational model of the earth's ring current, EOS Trans. AGU, 81(19), p.S388, 2000,

Moore, T E, M O Chandler, Requirements for low shear reconnection, EOS Trans. AGU, 81(19), p.S402, 2000.

Stevenson, B.A., J. L Horwitz, G A Germany, P D Craven, T E Moore, B L Giles, G K parks, and Y J Su, Relation of field-aligned O+ flows at 5000 km altitude to auroral structure and brightness, EOS Trans. AGU, 81(19), p.S391, 2000.

Su, Y.-J., J E Borovsky, M F Thomsen, N Dubouloz, M O Chandler, T E Moore, and J-A Sauvaud, A search for plasmaspheric material on high-latitude open field lines, EOS Trans AGU, 81(19), p.S368, 2000.

Tu, J., J H Horwitz, B A Stevenson, T E moore, V N Coffey, DyFK simulation of field-aligned ion flows observed by Polar within convecting flux tubes over the polar ionosphere, EOS Trans. AGU, 81(48), p.F1060, 2000.

Valek, P W, J D Perez, T E Moore, W K Peterson, Study of the spatial location of low energy ion population heating and outflow with respect to a persistent magnetospheric plasma boundary, EOS Trans. AGU, 81(19), p.S371, 2000.

Zeng, W., J. L. Horwitz, B. A. Stevenson, G. A. Germany, P. D. Craven, F. J. Rich, T. E. Moore, Topside ionosphere parameters observed bu POLAR and DMSP at high latitudes, Eos, 81(48), F1009, 2000.

Chandler, M. O., P. D. Craven, T. E. Moore, and V. N. Coffey, Plasma and field observations of the day-side, equatorial magnetopause, boundary layers, and magnetosphere, Spring AGU, EOS 82, S364, 2001.

Elliott, H. A., R. H. Comfort, P. D. Craven, T. E. Moore, M. O. Chandler, and C. T. Russell, By what process is ion outflow driven?, Spring AGU, EOS, 82 S376, 2001.

Elliott, H. A., R. H. Comfort, P. D. Craven, T. E. Moore, M. O. Chandler, and C. T. Russell, By what process is ion outflow driven?, *EOS vol 82, no. 20,* S 374; presented to the Spring Meeting of the American Geophysical Union, May 29-June 2, 2001b.

Giles, B L, T E Moore, C J Pollock, Functional description of magnetospheric-effective terrestrial outflows, EOS Trans. AGU, 82(48), p.S367, 2001.

Giles, B L, T E Moore, M Hirahara, Geospheric expansion into the plasma sheet with solar wind driving, EOS Trans. AGU, 82(48), 2001.

Moore, T E, B L Giles, M-C Fok, A GEM Perspective: magnetospheric plasma entry from the ionosphere, EOS Trans. AGU, 82(48), p.S367, 2001.

Moore, T E, M-C Fok, M O Chandler, and C J Pollock, Component reconnection on the dayside magnetopause, EOS Trans. AGU, 82(48), 2001.

Moore, T. E., M-C Fok, M. O. Chandler, and C. J. Pollock, Component merging on the dayside magnetopause, Spring AGU, EOS, 82, S368, 2001.

Pollock, C J, B L Giles, J-M Jahn, T E Moore, P Valek, J A Wiig, Observations of terrestrial polar wind outflows and their short term variability, EOS Trans. AGU, 82(48), p.S374, 2001.

Tu, J., X. Wu, J. L. Horwitz, B. A. Stevenson, T. E. Moore, and V. Coffey, Polar ionospheric simulations and observations, DyFK simulation of field-aligned ion flows observed by Polar within convecting flux tubes over the polar ionosphere, *EOS vol 82, no. 20,* S 361; presented to the Spring Meeting of the American Geophysical Union, May 29-June 2, 2001.

Collaborator Presented

Wüest, M., J. L. Burch, D. T. Young, M. Huddleston, D. L. Dempsey, B. L. Giles, J. E. Nordholt, H. Balsiger, A. Johnstone, and E. G. Shelley, Upflowing ions in the southern auroral zone observed with TIDE and TIMAS on the Polar spacecraft, Eos Trans. AGU, 77(46), F634, 1996.

Dempsey, D.L., M.M. Huddleston, J.L. Burch, ClJ. Pollock, J.H. Waite, Jr., M. Wüest, D.T. Young, T.E. Moore, and E.G. Shelley, Concurrent observations of reflected solar wind ions and downward accelerated ionospheric ions as seen by TIDE and TIMAS on the Polar spacecraft during the January 1997 magnetic cloud event, EOS, 78 (46), 1997 Supplement, Presented at the Fall 1997 Meeting of the AGU, December, 1997.

Vaisberg, O. L., L.A. Avanov, V.N. Smirnov A.A. Skalsky, N.E. Rybjeva, N.L. Borodkova, A.O. Fedorov, Yu. I. Yermolaev, G.N. Zastenker, J.L. Burch, J.H. Waite, Jr., C.J. Pollock, D.L. Dempsey, M.M. Huddleston, M. Wuest, D.T. Young, T. Phan, R. Lin, D. Larson, R. Lepping, T.E. Moore, P.D. Craven, W.K. Peterson, E.G. Shelley, P.H. Reiff, H.-A. Sauvaud and J.-H Shue, ISTP Observations of Magnetospheric Dynamics and Ion Plasma Transport during the October 1995 and January 1997 Magnetic Cloud Events, International Symposium on solar-Terrestrial Coupling Processes, Paros, Greece, 23-27 June 1997.

Wüest, M., J.L.Burch, D.L. Dempsey, M.M. Huddleston, C.J. Pollock, J.H. Waite, D.T. Young, T.E. Moore, PD. Craven, W.K. Peterson, E.G. Shelley, O.L. Vaisberg, V.N. Smirnov and L.A. Avanov, The January 1997 Magnetic Cloud Event observed with TIDE and TIMAS on Polar and SKA-1 on Interball/Tail, International Association of Geomagnetism and Aeronomy (IAGA), 8th Scientific Assembly, Uppsala, Sweden, August 1997.

Wüest, M., M.M. Huddleston, J.L. Burch, D.L. Dempsey, P.D. Craven, M.O. Chandler, W.K. Peterson, H.L. Collin, W. Lennartsson, Magnetospheric response to the arrival of the shock wave in front of the magnetic cloud event of January 10, 1997, Fall AGU, December 8-12, 1997, Eos Trans. AGU, 78, F609, 1997.

Engebretson, M J, M. R. Klatt, B. J. Anderson, R. R. Anderson, R. L. Arnoldy, S. A. Fuselier, H. Fukunishi, T. E. Moore, T. G. Onsager, and C. T. Russell, Characteristics of Pc1-2 emission regions in the outer dayside magnetosphere during magnetospheric compressions, EOS Trans. AGU, 80(46), p.F888, 1999.

Peterson, W. K., J. B. Cladis, O. W. Lennartsson, H. L. Colin, T. E. Moore, C. T. Russell, C. A. Kletzing, N. C. Maynard, and G. Lu, Energization and escape of O+ into the earth's polar cap and magnetotail, EOS Trans. AGU, 80(17), p.S249, 1999.

Russell, C. T., X. Zhou, P. Chi, J. Raider, R. J. Strangeway, H. J. Singer, H. Kawano, T. E. Moore, W. K. Peterson, J. B. Cladis, and E. Zesta, The response of the magnetosphere to the sudden impulse of 24 September, 1998, EOS Trans. AGU, 80(17), p. S244, 1999.

Strangeway, R. J., C. T. Russell, D. M. Klumpar, C. W. Carlson, J. P. McFadden, R. E. Ergun, R. C. Elphic, T. E. Moore, W. K. Peterson, Observations of intense ion outflows and cusp-region field-aligned currents during the September 24th and 25th 1998 Magnetic Storm, EOS Trans. AGU, 80(17), p.S245, 1999.

Winglee, R. M., T. E. Moore, M. C. Fok, B. L. Giles, and D. C. Delcourt, What is the role of ionospheric outflows in substorms and storms?, EOS Trans. AGU, 80-(17), p. S282, 1999.

Dubinen, E, A Skalsky, P Song, S Savin, J U Kozyra, T E Moore, C T Russell, A Fedorov, J-A Sauvaud, M O Chandler, Polar-Interball coordinated observations of plasma characteristics in the northern and southern distant cusps, EOS Trans. AGU, 81(19), p.S376, 2000.

Vaisberg, O L, J L burch, V N Smirnov, L A Avanov, T E Moore, J H Waite, A A Skalsky, N L Borodkova, V N Coffey, D N Gallagher, Magnetosheath flow anomalies in 3-D, EOS Trans. AGU, 81(48), p.F966, 2000.